

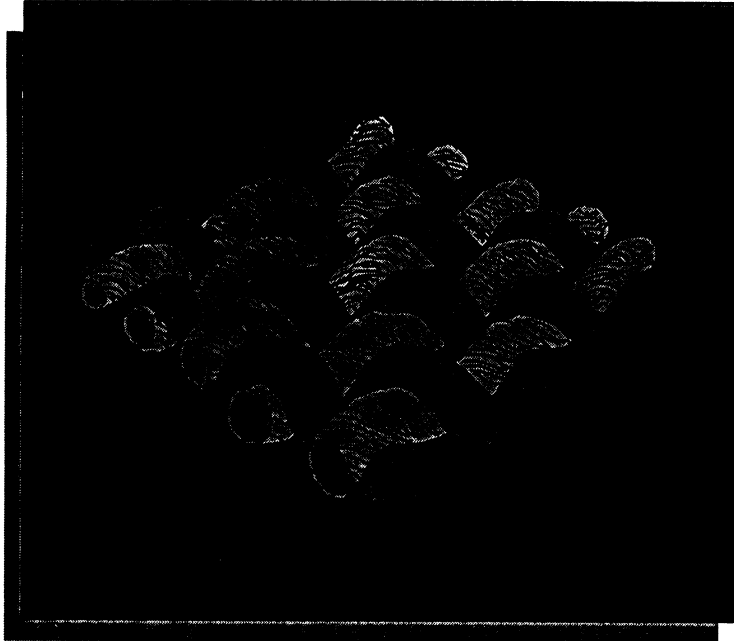
# **Spectra<sup>®</sup> Ballistic Materials in Aircraft Security**

# Applications

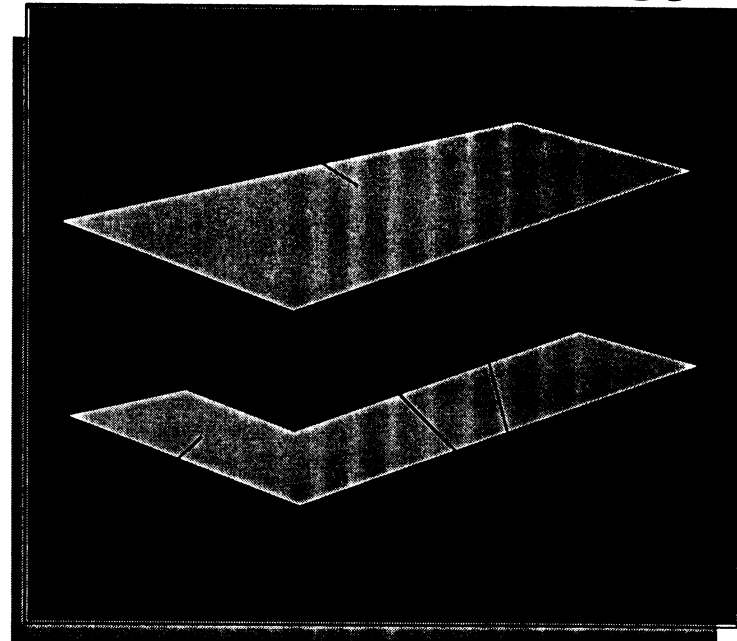
- **Armor - Vests, Helmets, Breast Plates, Vehicles,  
Spall Lining, Blast Containment**
- **Cordage - Ropes, Netting, Slings**
- **Fishing Lines - Spiderwire<sup>®</sup>**
- **Sporting Goods - Sailcloth, Kite String, Bow String,  
Backpacks, Water-ski Tow  
Lines**
- **Cut Resistance - Gloves, Aprons, Sleeves**
- **Composites - Golf Shafts, Radomes, Boat Hulls,  
Tennis Rackets**
- **Niche - Dental Floss, Space Tether, Medical**

# Spectra Shield® Technology

## Woven Fabric



## Shield Technology

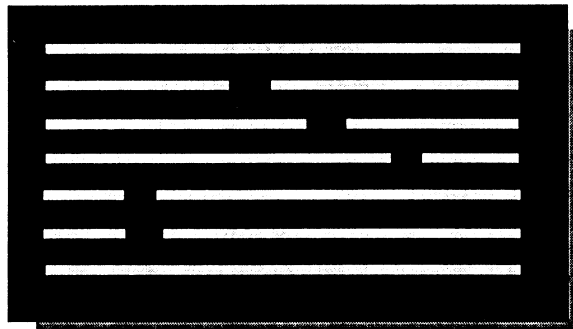


- In Shield Technology the fibers are not crimped, allowing the energy of the projectile to rapidly dissipate.
- Shield technology was developed by Honeywell in the late 1980's specifically for ballistics to maximize Spectra® fiber's high tenacity and high modulus properties.

**Spectra®**

# Spectra® Technology - Fiber Morphology

## Spectra® Gel-Spun Extended-Chain Fiber



- Very High Molecular Weight
- Very High Degree of Orientation
- Minimum Chain Folding

## Conventional Fiber (Nylon / Polyester)



- Relative Low Molecular Weight
- Moderate Orientation
- Crystalline Regions Chain Folded

- Spectra® is a High Modulus Polyethylene fiber. The high molecular weight of the polymer differentiates it from polyethylene used in every day applications.
- It's high Tenacity (strength) and high Modulus (stiffness) make it an outstanding ballistic material.

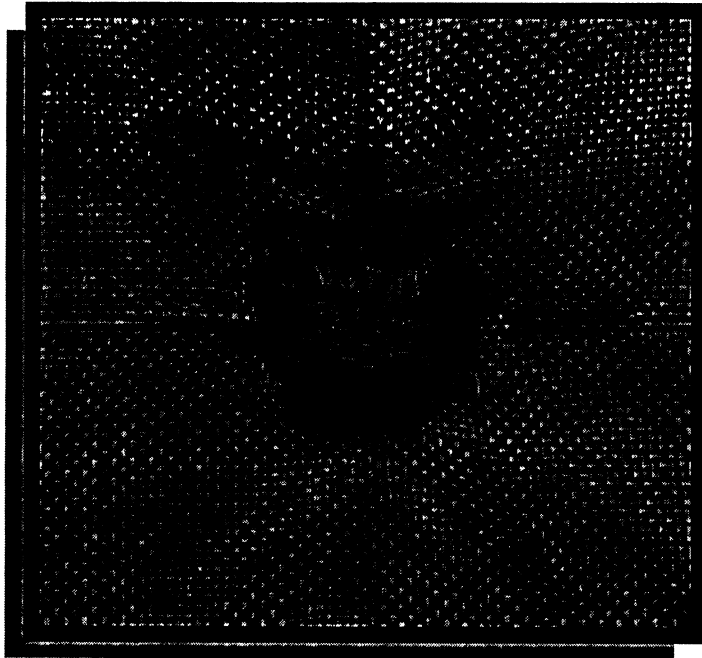


# **Spectra® Fiber Attributes**

- **One of the strongest and lightest manmade fibers**
- **Pound for pound 10 times stronger than steel**
- **Superior cut resistance**
- **Outstanding toughness and abrasion resistance**
- **Resists chemicals, water and sunlight**
- **Excellent flex fatigue and low stretch**
- **Light enough to float (.97 specific gravity)**
- **Low dielectric constant**
- **High modulus**
- **Excellent impact resistance**

# Spectra® Shield Technology

## Energy Dispersion Pattern



**Traditional  
Woven**



**Shield  
Technology**

**Non Woven Shield Technology rapidly disperses energy.**

**Spectra®**

# **Spectra® Strengths in Cockpit Door Applications**

- **Light weight**
  - **Specific gravity less than one (.97)**
- **Outstanding Impact Resistance**
  - **High tenacity and high modulus**
- **Hydrophobic Properties**
  - **Spectra® fiber does not absorb or degrade in water**
- **Chemical Inertness**
  - **Spectra® fiber does not degrade when exposed to most chemicals**
- **Spectra® Composites can be designed to pass FAA flammability requirements.**